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<p>(54) Title: USE OF BANKING SERVICES IN A DIGITAL CELLULAR RADIO SYSTEM</p> <p>(57) Abstract</p> <p>Banking services are used by means of a bi-directional short message connection. A user sends a request concerning a banking service as a short message which is routed via a cellular radio system (11, 12) and short message service center (13, 14) to a bank's user interface server (16). Data relating to the request are further sent to the bank's self service unit (17) which carries out the services requested and sends the resulting data in the form of short message back to the user.</p> <pre> graph TD     UI[USER INTERFACE SERVER] --&gt; SSU[SELF SERVICE UNIT]     UI --&gt; BAC[BANKING APPLICATION COMPUTER]     SSU --&gt; CC[CREDIT CARD COMPANY]     SSU -.-&gt; VT[VT100]     UI -.-&gt; SMSCA[SMSC A]     UI -.-&gt; SMSCB[SMSC B]     SMSCA -.-&gt; GSMA[GSM A]     SMSCB -.-&gt; GSMB[GSM B]     GSMA &lt;--&gt; GSMB   </pre>		

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## Use of banking services in a digital cellular radio system

The invention relates in general to the utilization of data communications facilities offered by a digital cellular radio system. In particular the invention relates to the utilization of short message type data communications in order to provide banking services to the users of cellular radio system terminals.

Nowadays, many banking services can be remotely used. For example, a customer who has access to a computer and a modem may establish a data communications connection between his and the bank's computer and use normal banking services, e.g. view the balance and the latest transactions on an account or pay a bill. The connection between the user's and the bank's computer is then a telephone connection realised through wires in a conventional telephone network or at least partly through radio waves in a mobile telephone system. Users, whose only communications device is a phone, are also offered some banking services. In the conventional telephone banking system the bank or a telephone network operator authorized by the bank maintains a so-called tone service equipment which responds to dual tone multifrequency (DTMF) signals sent by the user's telephone apparatus that correspond to keystrokes. In response to DTMF signal sequences entered by the user the tone service equipment produces transaction commands which it sends to the bank's central computer so that desired transactions be directed to the user's account. The tone service equipment may also play via the telephone connection voice messages to the user which it reads from the memory or produces by means of a speech synthesizer, based on the responses sent by the bank's central computer.

Prior-art methods for remotely using banking services have some disadvantages. A computer and a modem are relatively expensive items to purchase, so they are not suitable to all users. The user of a telephone banking system has to key in long sequences of digits, especially when paying bills, without seeing them on a display so that the possibility of an input error is high. As the data communications requires a continuous telephone connection, for which the network operator usually charges on the basis of the connection time used, input errors and/or the use of more complex services increase the costs of the services used.

An object of this invention is to provide a novel method for providing banking services to users independent of time and place. A particular object of the invention is that the method according to it is easy to use. An additional object of the invention is to provide a system that realizes the method.

The objects of the invention are achieved by transferring the banking services related data between the user and the bank in both directions in short message type messages of a digital cellular radio system.

The method according to the invention is characterized in that it comprises steps

5 wherein

- a first short message is transferred from the user's terminal via a cellular radio network to a short message service center,
- said short message is routed from the short message service center to the bank's user interface server,
- 10 - data contained in the first short message are transferred from the user interface server to the bank's self service unit,
- based on the data contained in the first short message a first banking service is carried out,
- a first reply representing the result of said first banking service is transferred from
- 15 the bank's self service unit to the user interface server, and
- said first reply is included in a second short message which is sent from the user interface server via the short message service center and cellular radio network to the user's terminal.

The invention is also directed to a system to realize the method described above.

20 The system according to the invention is characterized in that it comprises

- at least one digital cellular radio system and in connection with it at least one short message service center,
- a user interface server to automatically send and receive short messages,
- a data communications connection to transfer short messages between a short
- 25 message service center and a user interface server,
- a self service unit to provide self service type banking services,
- a data communications connection to transfer data related to banking services between a user interface server and a self service unit,
- a banking application computer, and
- 30 - a data communications connection to transfer transactions and data resulting from transactions between a self service unit and a banking application computer.

It is known from digital cellular radio systems a so-called short message service, SMS, which refers to the transfer of relatively short character string type messages between apparatus in a system without establishing a telephone connection proper.

35 In the method according to the invention the user creates on his terminal a short message which conforms to a certain syntax and includes in it the information

required by the banking service requested by the user. The cellular radio system transfers the short message in a known manner to a short message service center wherefrom it is further transferred to a user interface server provided by the bank especially for this purpose and therefrom to other computers of the bank to carry out  
5 the service requested by the user. The reply message in which the bank gives the information requested and/or acknowledges that the transaction requested by the user has been completed is also transferred as a short message from the bank's computers via the user interface server to the short message service center and therefrom via the cellular radio system in a known manner to the terminal. The  
10 invention does not require that the exchange of messages always occur initiated by the user; in some service types, the bank or another party taking part in the payments traffic may start the procedure by sending a short message to which the user can respond by sending a reply message. Furthermore, some services advantageously require more than one two-way transmission and/or reply message, i.e. the  
15 invention does not limit the number of short messages required to use a service.

In the system according to the invention a user interface server maintained by the bank or another party authorized by the bank makes the adaptations needed if short message service centers maintained by different network operators require different communication protocols. In an arrangement that has been found advantageous the  
20 bank has a so-called self service unit, or a special computer to realize security functions and other such features which are common to all self service type services offered to customers. The user interface server in the short message service makes the necessary protocol conversions between the communication protocols used by the short message service centers and the self service unit. The self service unit  
25 communicates with the bank's main computers that maintain databases containing the customer account data, among other things. The self service unit may also communicate with computers of other parties that may be requested to send information to a short message service user. Such a party could be e.g. a credit card company.

Creating, editing and reading of short messages are carried out on the display of the  
30 terminal, which makes the method according to the invention clear and easy to use compared to entering digit sequences by means of phone keypad keys only. The short message services already exist in modern mobile phones of digital cellular radio systems, so that the owner of a suitable phone need not make any new purchases in order to be able to use the method according to the invention. At the  
35 moment, network operators charge a fixed sum for the transfer of a short message, so the amount of data entered for a transaction or the time used for creating a

message or for viewing the information sent by the bank do not affect the costs paid by the user. Short messages are transferred in the form of signalling and do not require a continuous telephone connection between the terminal and a base station; short messages can also be transferred during a call. A short message is usually  
5 delivered error-free even if the conditions are bad, because a disconnection caused by a momentary disturbance, shadow region or switching-off of the phone will not destroy the data but it remains waiting for better transmission conditions.

The invention will now be described in more detail with reference to the preferred embodiment presented by way of example and to the accompanying drawing  
10 wherein

- Fig. 1 shows the system according to the invention,  
Fig. 2 shows the method according to the invention being used for balance inquiry, and  
Fig. 3 shows the method according to the invention being used for payment of a  
15 bill.

In Fig. 1, a mobile phone 10 may operate either in the network 11 of operator A or in the network 12 of operator B. Networks 11 and 12 are digital cellular radio systems, e.g. GSM (Global System for Mobile telecommunications) systems, which  
20 are regulated by the standards drawn up for the system. Here it is assumed that the standards of the systems include the so-called short message service, i.e. the transfer of relatively short character string type messages between apparatus in the system. In GSM systems the maximum length of a short message, or SMS message, is 160 characters. In addition, the system transfers a header part for each message  
25 containing, among other things, the sender and receiver information. The GSM system does not specify in detail the operation of a short message service center responsible for the collection and distribution of short messages, which has led to that the short message service centers of different operators or at least the interfaces to them may function in a slightly different manner. In the case depicted by Fig. 1,  
30 both operators maintain short message service centers 13, 14 (SMSC) of their own.

The bank's computer equipment 15 consists of a user interface server 16, self service unit 17, and a banking application computer 18. The user interface server 16 is typically a powerful data communications server or the like, the self service unit 17 is typically a so-called minicomputer or the like, and the banking application computer 18 is typically a so-called mainframe computer or the like. The self service unit 17 and its connection to the banking application computer 18 are known  
35

e.g. from so-called PC banking services. The PC banking service customers 19 may communicate direct with the self service unit if the service uses the VT100 or 3270 emulation or another suitable terminal emulation. The connection between the self service unit 17 and the user interface server 16 is preferably a TCP/IP socket connection or an X.25 connection, both known from the prior art.

In the embodiment shown in Fig. 1 the short message service centers 13 and 14 of both operators A and B communicate with the user interface server 16 across a known public X.25 network. The invention does not require a standard interface between the short message service centers and the user interface server but many 10 different adapters can be installed in the latter in order to realize data communication with different short message service centers.

In Fig. 1, the self service unit 17 communicates in a known manner with a computer at a credit card company 20. This link is intended to be used in conjunction with credit card inquiries, i.e. the self service unit 17 may send to the computer of the 15 credit card company 20 a customer code and the latter will respond by sending that customer's payment transaction data from a predetermined time period.

Fig. 2 shows an advantageous procedure to realize a balance inquiry in the system according to Fig. 1. In the first step 21 the user creates on his terminal a short message that includes the information needed for identifying the user and a 20 command part on the basis of which the message can be interpreted to mean a balance inquiry. The short message must conform to a predetermined syntax for a computer to be able to process it. An advantageous short message syntax is for example

AAAAAAAXXXXT, (1)

25 where AAAA represents the user's six-character username, XXXX stands for the user's four-character password, and T is a one-character command part. Here it is assumed that in the short message service contract with the bank the user has specified that balance inquiries made without an account number are directed to a so-called primary account. If the user were to inquire the balance of another account 30 belonging to him, he could enter the short message e.g. as follows:

AAAAAAAXXXXT111111-222222, (2)

where 111111-222222 is the account number.

Considering the existing devices in use, most users have to create the short messages using the number keys 0 to 9 and the so-called text mode and, therefore, it is preferable to keep the predetermined short message syntaxes as short as possible. This is why it was above proposed that the length of the command part be one character only. In practice, the command part may comprise e.g. a character or a word starting with that character because for many users it is easier to memorize whole words than single characters. The user need not include his mobile phone number in the short message as it is automatically transferred in the header part of the short message.

- 5 10 In step 22 the user sends a short message which is taken to a base station of the cellular radio system, thence to a mobile switching center, further to a short message service center, and finally to the bank's user interface server which is the receiver of the short message. The receiver is indicated in the sending of the short message by keying in the code for the receiver. It is preferable that the bank reserves from all operators offering the short message service one and the same code for the service according to the invention, lest the user need to use different codes depending on whose network he is in. Step 22 includes all the known steps by means of which the cellular radio system attempts to guarantee the delivery of the short message in all circumstances. If, for example, the sender's terminal is momentarily in a shadow 15 20 region and cannot establish a good signalling connection with any base station, the short message is stored in the terminal's memory and retransmission will be attempted at regular intervals until the transmission succeeds.

In step 23 the user interface server forwards the balance inquiry included in the short message to the bank's self service unit which verifies that the username and password in the message match and that the user identified by the username is authorized to use the short message service according to the invention. At the same time the self service unit adds to the balance inquiry the user's primary account number if the inquiry did not include an account number.

In step 24 the self service unit delivers in a known manner a database-language 30 balance inquiry to a banking application computer which in response to the inquiry returns the balance requested. In step 25 the self service unit creates a reply message which may have e.g. the following syntax:

USER AAAAAAA ACCOUNT 111111-222222 BALANCE +3333.44 DATE  
DD.MM.YYYY TIME HH:MM HAVE A NICE DAY, (3)

where AAAAAA is the user's username, 111111-222222 is the account number (the dash is optional in short messages), +3333.44 is the balance of the account received from the banking application computer, DD.MM.YYYY is the date of the inquiry and HH:MM is the time of the inquiry. The self service unit delivers the message  
5 via a TCP/IP socket to the user interface server which in step 26 forwards it as a short message via a short message service center, mobile switching center and base station to the user's terminal. Step 26 includes all the known steps with which the cellular radio system attempts to guarantee the delivery of the short message in all circumstances. In addition, it is advantageous to include in the header part of the  
10 message or in the message itself a code indicating the balance inquiry to which this particular reply relates, because if the delivery of the reply message is delayed, it may be difficult for the user to identify the inquiry to which the reply relates. In step 27 the user reads the short message he has received.

Fig. 3 shows a preferred procedure for paying a bill in the system according to Fig.  
15 1. The first step 31 corresponds to step 21 in Fig. 2 in such a manner that the user creates on his terminal a short message containing the information needed to identify the user and a command part on the basis of which the message can be interpreted to mean a request to pay a bill. The syntax of the short message may be the same as the syntax (1) above, with the exception that the command part  
20 comprises another letter or word. Step 32 corresponds to step 22 in Fig. 2, i.e. in it the user sends the short message which is directed to a base station of the cellular radio system, from there to a mobile switching center, further to a short message service center and finally to the bank's user interface server which is the receiver of the short message. In step 33 the user interface server sends the payment request to  
25 the self service unit which verifies the username and password as well as the user's rights. In step 34 the self service unit produces a so-called payment template which may be e.g. a character string as follows:

USR:AAAAAA PW:\_N1:1111 N2:\_AC:222222-333333  
REC:\_AM:\_DUE:\_REF:\_MSG:\_ (4)

30 Here, abbreviations USR, PW, N1, N2, AC, REC, AM, DUE, REF and MSG are names of fields in the payment template. In step 35 the payment template (4) is transferred as a short message to the user's terminal.

In step 36 the user opens the payment template for editing. In the USR field the self service unit has already placed the username it has read from the payment request  
35 sent by the user. In the PW field the user enters his password. In the N1 field the

self service unit has inserted a so-called seed number, and the user looks up a corresponding number in his list of seed numbers and counter-numbers and enters it in the N2 field. In the AC field the self service unit has placed the user's primary account number. If the user wants to pay the bill from another account he can at this  
5 stage substitute the desired account number for the default account number. In the REC field the user enters the account number of the receiver of the payment and in the AM field the amount to pay. In the DUE field the user may enter the due date of the payment. If the user wants to make the payment immediately he can leave the DUE field empty. In the REF field the user may enter the reference number of the  
10 payment and in the MSG field a short text message to the receiver of the payment. In many banking applications only one of these two may be entered, so if the user gives the reference number he cannot enter a message and vice versa. Length of the text message is limited in the method according to the invention by the fact that the length of the whole short message may not exceed 160 characters according to the  
15 GSM standards.

Having entered the necessary information on the payment template the user sends in step 37 the whole character string thus produced in the form of short message to the bank's user interface server. Again, step 37 includes all the known steps with which the cellular radio system attempts to guarantee the delivery of the short message in  
20 all circumstances. In step 38 the bank's user interface server that received the short message sends the payment data included in the short message to the bank's self service unit which verifies that the username and password as well as the seed number and counter-number in the message match each other and that the user identified by the username is authorized to use the short message service according  
25 to the invention. In step 39 the self service unit gives in a known manner a database-language payment transaction order to a banking application computer which in response to the order performs the payment transaction and as a reply returns to the self service unit information about whether the payment was successfully made or not. In step 40 the self service unit on the basis of the reply creates an acknowledge  
30 message which may be e.g. a character string as follows:

USER:AAAAAA ACCOUNT 111111-222222 PAID TO ACCOUNT  
333333-444444 AMOUNT 3333.44 DATE DD.MM.YYYY TIME HH:MM  
REF 5 66666 77777 HAVE A NICE DAY, (4)

Here, AAAAAA is the username, 111111-222222 is the number of the account  
35 debited, 333333-444444 is the number of the account credited, 3333.44 is the amount paid, DD.MM.YYYY is the date of payment, HH:MM is the time of

payment, and 5 66666 77777 is the reference number of the payment. In step 41 the character string in question is transferred in the manner described above in the form of short message to the user's terminal and in step 42 the user reads the short message he has received and thus learns that the payment has been made.

- 5 An alternative payment method is based on that a payment template is stored in the memory medium (such as the SIM card of a GSM phone) of the user's terminal so that the self service unit in the bank's computer system need not send it in the form of short message in conjunction with every payment of a bill. Other short message templates may also be stored in the terminal's memory media so that the user only
- 10 fills in the necessary information. This saves keystrokes, especially in a situation in which the user wants to use one and the same banking service several times in succession, e.g. pay several bills in a row.

The payment method described above assumes that the user knows in advance the contents of the bill, i.e. the account number of the receiver of the payment, the sum  
15 of the payment, the reference number and the due date. These data may also be delivered to the user in the form of short message in the case of a so-called electronic bill. The invoicing party, say, a network operator, may send to the user a short message that contains the invoice data mentioned above. The user may use that short message as a template for the payment short message so that he need not  
20 key in the data again.

It is obvious to a person skilled in the art that the character strings described above are purely illustrative in their syntax and content. Likewise, the banking services described above are only examples of how the method and system according to the invention can be applied in offering various services to users who have at their disposal a mobile phone or a digital cellular radio system or a corresponding terminal capable of sending and receiving short messages. For example, a reply to a balance inquiry may in addition to the balance include as many latest transactions as there is room for in the short message. Using a short message of a certain kind the user may also make an inquiry concerning the payment data relating to his credit  
25 card, and on the basis of that inquiry the self service unit in the bank's computer system fetches the requested data from the credit card company's computer and sends them in the form of short message to the user's terminal. The credit card inquiry, with which the user requests the self service unit to fetch said data, is from the user's standpoint similar to the short message (1) described above with the  
30 exception that the command part comprises a letter or word referring to credit card inquiries. If the customer has got several credit cards he may give the number of the  
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credit card in question as a parameter in the short message like in the short message (2) described above.

The numbers of sent and received messages relating to a particular service are independent of each other. So, the user may send more than one message relating to  
5 a particular service and, on the other hand, the system may reply to the user using more than one message.

Other services for which the method according to the invention is suitable include investment services, for example. The user may store in the self service unit of the bank's computer system thresholds for selected securities in order to become notified when those thresholds are exceeded in the stock exchange. When the quotation  
10 of a particular share, for instance, exceeds or goes below the threshold set by the user, the self service unit generates a message about it and sends it in the form of short message to the user's terminal. The user may also use short messages of a certain kind to subscribe to a new service or to terminate the subscription to a service.  
15 If the user also uses PC banking services, telephone banking services and/or other self services, the usernames, passwords and seed number and counter-number lists preferably are common to all those services lest the user have to memorize several different codes. At the same time, memory space is saved in the bank's self service unit as there is no need to store several identification mechanisms for one  
20 user.

Still other services to which the invention is applicable include extended transaction inquiries, transfer of statements of account, inquiries concerning standing orders, balance inquiries, statements of balance and instalment plans in conjunction with loan services, inquiries of own accounts (account numbers and balances), ordering  
25 services, currency and stock exchange services and marketing services. As the transfer of short messages does not depend on the location of the terminal (as long as it is within the coverage area of the cellular radio system) all the services described above can be used abroad as well.

In order to guarantee bank secrecy, encryption can be applied in the transfer of short  
30 messages. A preferred embodiment is based on encryption with a so-called public key, wherein a message sent to a receiver can be encrypted using the receiver's public key so that the encrypted message can be opened only by means of the same receiver's secret key. A terminal in a digital cellular radio system or its smartcard may include a microprocessor the memory of which contains at least the user's secret key and the bank's public key as well as the encryption algorithms. Short  
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messages sent by the user are routed via the encrypting processor which encrypts them using the bank's public key. The information thus encrypted is opened only in the bank's computer which knows the bank's secret key. Correspondingly, along with other user data the user's public key has been stored in the bank's computer  
5 with which said computer encrypts the short messages before they are sent to the user. To open an encrypted message, it must be routed via the encrypting processor in the terminal which decrypts the message using the user's secret key.

The method and system according to the invention could also be made such that the user could use the service only from a predetermined terminal. Terminals of digital  
10 cellular radio systems include in their messages information about the identity of the sending terminal. The user may agree with the bank that the user interface server delivers this information to the self service unit along with other data, so that the self service unit will verify, in addition to the items described above, also whether the short message was sent from the correct terminal. This is to prevent  
15 unauthorized use of the service in a situation wherein the username and password and possibly the seed number and counter-number list have fallen into the wrong hands but the terminal has not. A disadvantage is that the user's operational possibilities will be limited because he would then need a particular terminal or at least a particular subscriber identity module, or SIM card, to be able to use banking  
20 services based on short messages.

**Claims**

1. A method for using banking services through a digital cellular radio system, characterized in that it comprises steps wherein

- a first short message is transferred from the user's terminal (10) via a cellular radio

5 network (11, 12) to a short message service center (13, 14),

- said short message is routed from the short message service center (13, 14) to a bank's user interface server (16),

- data contained in the first short message are transferred from the user interface server (16) to the bank's self service unit (17),

10 - based on the data contained in the first short message a first banking service is carried out,

- a first reply representing the outcome of said first banking service is transferred from the bank's self service unit (17) to the user interface server (16), and

- said first reply is included in a second short message which is sent from the user

15 interface server (16) via the short message service center (13, 14) and cellular radio network (11, 12) to the user's terminal (10).

2. The method of claim 1, characterized in that said first banking service is an inquiry wherein in response to the reception of the data included in a first short message a database inquiry (24) is directed to the account of the user identified on the basis of said data and the information resulting from said database inquiry is included as a first reply in a second short message.

3. The method of claim 1, characterized in that said first banking service comprises the creation of a message template so that

- in response to the reception of the data included in a first short message the sender of the first short message is identified on the basis of said data and a message template (34) prefilled with information concerning the sender is created,

- said message template is included as a first reply in a second short message which is sent (35) from the user interface server via a short message service center and cellular radio network to the user's terminal,

30 - a third short message including the completed message template is transferred (37) from the user's terminal via the cellular radio network to a short message service center,

- said third short message is routed from the short message service center to the bank's user interface server,

35 - data contained in the third short message are transferred from the user interface server to the bank's self service unit,

- a second banking service (39) is carried out on the basis of the data contained in the third short message,

- a second reply representing the outcome of said second banking service is transferred from the bank's self service unit to the user interface server, and

5 - said second reply is included in a fourth short message which is sent (41) from the user interface server via a short message service center and cellular radio network to the user's terminal.

4. The method of claim 3, **characterized** in that said second banking service is a payment so that in response to the reception of the data contained in the third short  
10 message a payment transaction (39) is carried out on the basis of said data and the data representing the result of the transaction are included as a second reply in the fourth short message.

5. A system for using banking services through a digital cellular radio system, **characterized** in that it comprises

15 - at least one digital cellular radio system (11, 12) and in connection with it at least one short message service center (13, 14),  
- a user interface server (16) to automatically send and receive short messages,  
- a data communications connection to transfer short messages between a short message service center and a user interface server,  
20 - a self service unit (17) to provide self service type banking services,  
- a data communications connection to transfer data related to banking services between a user interface server and a self service unit,  
- a banking application computer (18), and  
- a data communications connection to transfer transactions and data resulting from  
25 transactions between a self service unit and a banking application computer.

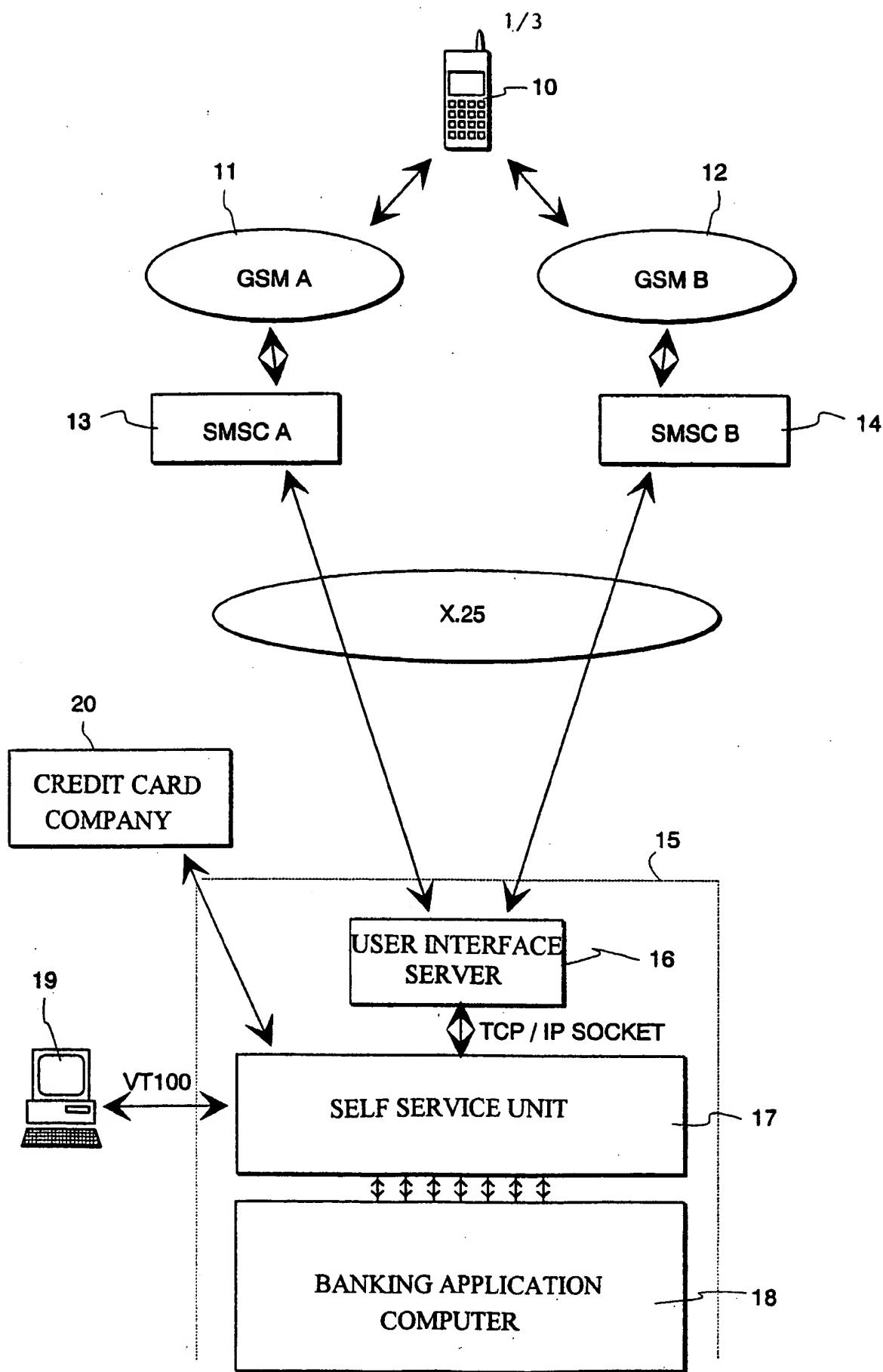


Fig. 1

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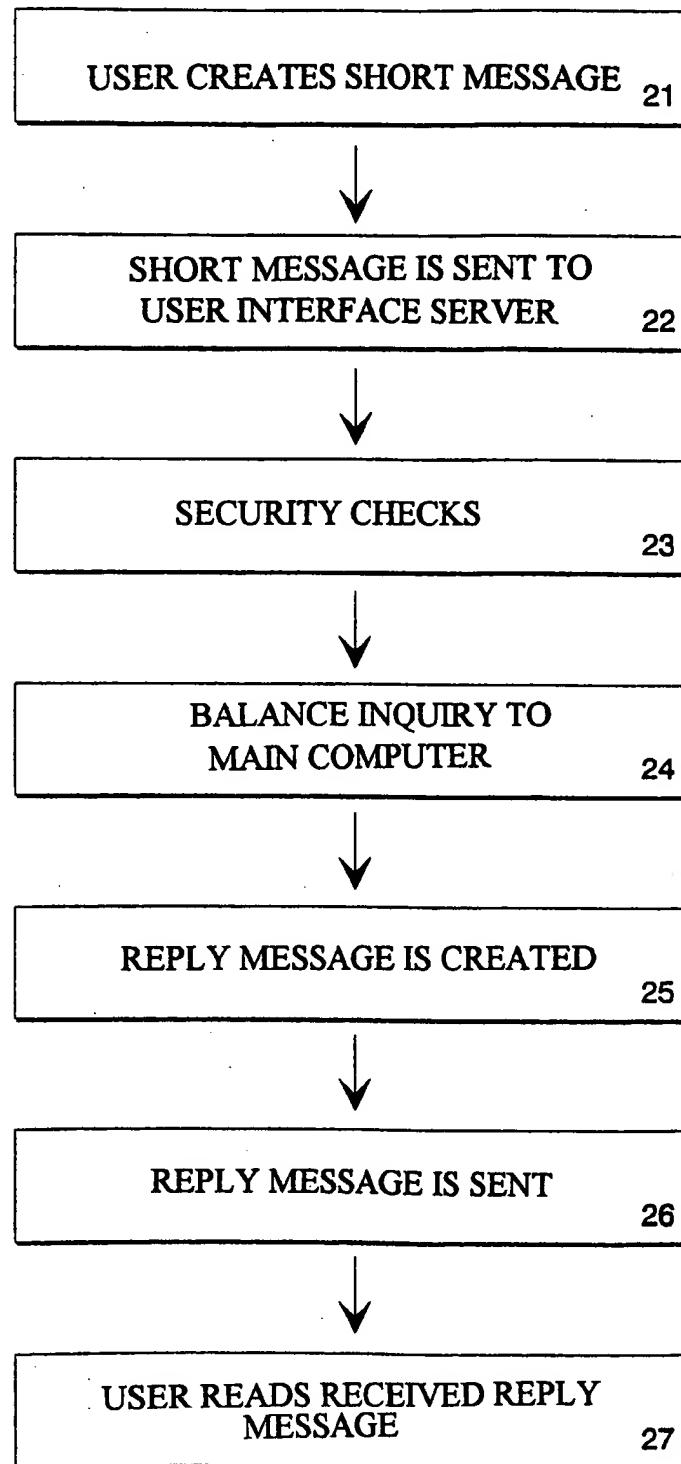


Fig. 2

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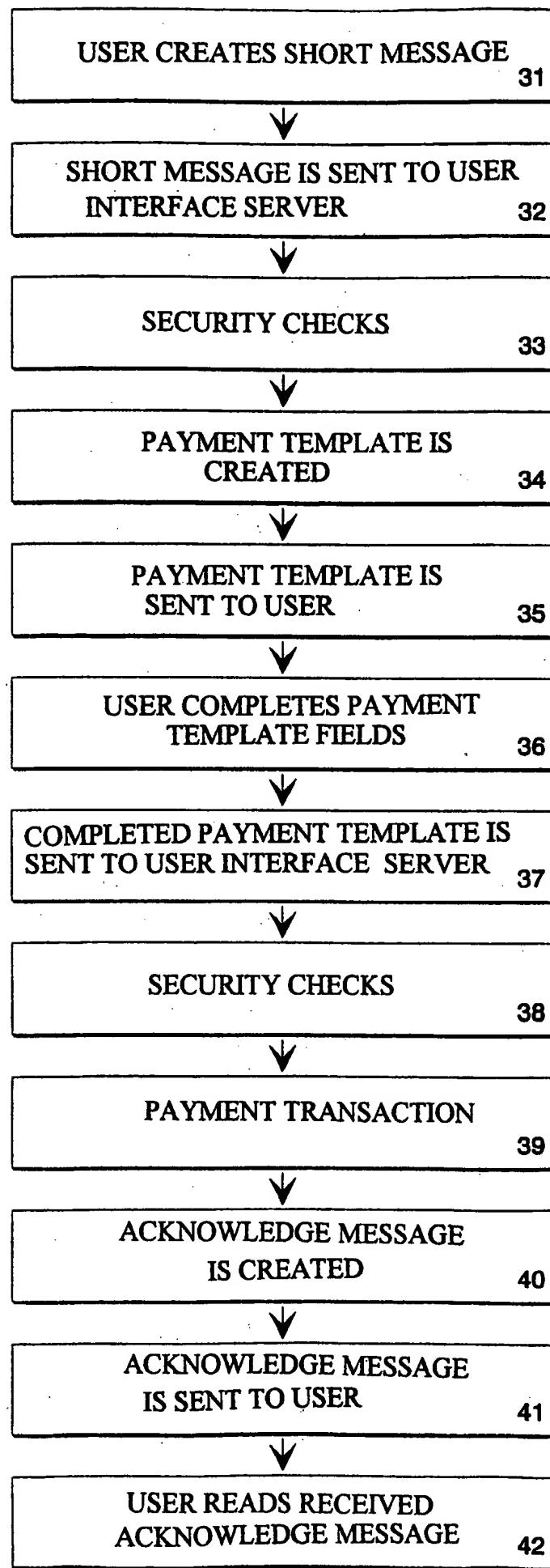


Fig. 3